Cibtech Journal of Bio-Protocols ISSN: 2319–3840 (Online)
An Open Access, Online International Journal Available at http://www.cibtech.org/cjbp.htm
2015 Vol. 4 (3) September-December, pp.13-16/Shashi Kanta
Research Article

EFFECT OF MICROSPRINKLER, DRIP, SUBSURFACE AND FURROW IRRIGATION SYSTEMS ON GROWTH AND LEAF YIELD OF MULBERRY IN THE SHIVALIK FOOT HILL OF PUNJAB

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ABSTRACT
Mulberry is a hardy plant capable of thriving under a variety of agro climatic conditions. At the same time, it is also sensitive responding extremely well to optimum agricultural inputs but showing practically no growth when plant nutrients and moisture begin to operate as limiting factors. This is evidence from the fact that under the poor rainfall conditions of 25-30 (625-750 mm) prevailing in India, the current leaf yield is of the order of only 3,000-3,500 kgs per hectare whereas under assured irrigation and appropriate fertilizer application, it can be stepped up to 30,000 kgs.
After monsoon water becomes the limiting factor and adversely affects the growth and leaf of mulberry and consequently the raw silk production particularly during the dry period, December to May Spacing recorded 15.58% increase over wider spacing possibly due to increase plant population. As such; it is suggested to use micro-sprinkler system. A field experiment was carried out during December to May for two years at the Central Serucultural Research &Training Institute, Sujanpur for two years using S cultivar of mulberry with two different spacing viz.60x60cm and 45x15 cm in a spilt-plot design having three replications. Four systems of irrigation viz. drip, micro-sprinkler, subsurface and alternate furrow were employed each with two levels of irrigation based on I W/CPE (irrigation water/cumulative pan evaporation) ratios of 0.4 and 0.6 the plants were maintained following the recommended package of practices for irrigated mulberry .The result was 3,500 kg per hectare whereas under assured irrigation and appropriate fertilizer application, it can be stepped up to 30,000 kg or so, or nearly ten times.
With the cession of monsoon water becomes the limiting factor and adversely affects the growth and leaf of mulberry and consequently the raw silk production particularly during the dry to 5.0 ha cm of water in mulberry garden by furrow method at 10 days intervals for sandy loam soil and at 15 days intervals for clayey loam soil during December to April in south India (Krishnaswami, 1986) while in Punjab indicated that plants height, number of branches and level per plant and leaf yield due to irrigation at 0.4 and 0.6 IW/CPE ratios being at per the lower level of irrigation is preferable thereby saving 33%of irrigation water vis-à-vis the earlier recommendation of 4.5 ha cm at fortnightly intervals. As regards the system of irrigation, micro –sprinkler irrigation recorded significantly taller plants ,higher number of branches and leaves (plant and leaf yield) over drip, subsurface and alternate furrow systems of irrigation, the first three systems recording 23.45%,11.34% gain over alternate furrow method ,the drip and subsurface system being at per. Wider plant spacing (60 x 60 cm) recorded significantly taller plants (114.95 cm),higher number of branches (9.37) and leaves (189.48)/plants vis-à-vis closer spacing (45x15 cm).on the other hand .leaf yield due to close irrigation at 0.4 IW/CPE ratio

Key words: *Micro- sprinkler, drip, subsurface, alternate furrow irrigation, IW/CPE ratio, mulberry, spacing, growth, leaf yield.*

INTRODUCTION
Mulberry is a hardy plant capable of thriving under a variety of agro climatic conditions. At the same time, it is also sensitive responding extremely well to optimum agricultural inputs but showing practically no growth when plant nutrients and moisture begin to operate as limiting factors. This is evident from the fact that under the poor rainfall conditions of 25-30 (625-750 mm) prevailing in South India, the current leaf yield is of the order of only 3,000- period, December to May. Thus to overcome this limitation and to augment the yield irrigation is essential for mulberry. It is reported that irrigation given between

December and April significantly increased the leaf yield by 68% (Kasiviswanathan and lyenger, 1965). It was advocated to apply 3.

MATERIALS AND METHODS

Experiment was carried out during December to may for two year in the field at the central Sericultural Research & Training Institute. Sujanpur, using S, cultivar of mulberry with two application of 4.5 ha cm of water for clayey loam soil at fortnightly intervals between December and May was suggested through the conventional flood irrigation. But then, Choudhury and Giridhar (1987) working with surface irrigation recommended alternate furrow irrigation at 0.4 IW/CPE ratio (3 ha cm or 3,00,000 water /ha/irrigation) for mulberry with 60 cm x 60 cm spacing in the Dinnnagar of Punjab. Saratchndra *et al*., (1992) considered drip and sprinkler irrigation systems to be more efficient in economizing water use and maximizing the leaf yield of mulberry vis -a-vis furrow system. However, in the past, water requirement of mulberry through micro-irrigation systems was worked out based on conventional approaches. As such information on scheduling of irrigation based on climatologically approach which is now considered more scientific vis –a – vis efficacy of irrigation system under different micro irrigation system under different plant spacing is lacking (Purohit, 2005). Thus, to make a comparative study on the efficacy of different micro irrigation system vis-a- vis alternate furrow system at different IW/CPE ratios and plant spacing, this experiment was undertaken.

Objectives

1. To conduct research and developmental work for improvement in quality mulberry leaf productivity by evolving appropriate irrigated and rain fed agronomical packages for high yielding mulberry varieties from time to time.
2. To develop cost-effective mulberry cultivation technology.
3. Promotion of eco -friendly technologies, maintenance of soil health and redress of agro-ecological condition with curtailment of inorganic fertilizers in mulberry cultivation.

RESULTS AND DISCUSSION

Effects of level of irrigation (IW/CPE ratio):

Irrigation at 0.4and 0.6 IW /CPE ratios with 3.0cm and 4.5 cm depth of irrigation water (i.e.3, 00,000 I water /ha and 4, 50,000 I water /ha) did not influence the plants height, number of branches and leaves per plant as also the leaf yield (table1) the growth and yield parameters due to irrigation at 0.4 and 0.6 IW/CPE ratios being at per the lower level of irrigation is preferable. Different spacing i.e60x60 cm^2 and 45x15 cm^2 It was laid out in a split –plot design having three replications .The treatment comprised four system of irrigation –ciz. Drip micro sprinkler, subsurface and alternate furrow each with two levels of irrigation based on IW/CPE ratio mentioned above in the sub –plots.(Purohit ,K.M.;Ghosh ,J.K.;Sen, Das and N,Saratchandra) Drip system consisted of fixed CPE value of mm in main plots and two different spacing as mentioned above in the sub plots. Drip system consisted of emitters at 60 cm intervals for 60x60 cm spacing and at 30cm intervals for 45x5 cm spacing with the laterals laid between alternate rows.(Sikdar, A.K and Chandrashekar, D.S.1992)The sprinkler system was a non – portable micro – sprinkler type sub- surface irrigation system consist of bi-wall perforated tubes laid in alternate rows. The sprinkler systems was a non-portable micro- sprinkler type (four per plot).sub –surface irrigation system consisted of bi-wall perforated tubes laid in alternative rows at 20 cm depth of soil and having pores at 30 cm intervals .the plot size was 4.88x4.88m. Mulberry plants of all the plots were given bottom pruning during last week of November and February every year and were maintained uniformly following the recommended "package of practices" (Mukherjee, 1972). In case of micro-irrigation system was given at four days intervals during winter and at three days intervals during summer spread over a fixed CPE value of 75 mm while in alternate of water at 1.0kg pressure per unit time through the micro-tube of drip, micro-sprinkler and pore of the sub –surface systems while alternate rainfall received between two irrigation ,if any ,was considered for calculating the subsequent date of irrigation. Plant height, number of

branches, leaves per plant and leaf yield were recorded during February and May over the two years AS the trends of results were found to be almost similar (Mukherjee *et al.,* 1972).

Plant spacing:

Spacing significantly influenced the height of plants, number of branches and leaves per plants as also the leaf yield; wider spacing (60x60 cm) recording significantly taller plants, number of branches and leaves (189.48) per plant compared to closer spacing (45x15cm). However, as regards leaf yield, closer spacing registered significantly higher yield.

Effect of various irrigation systems:

Micro-sprinkler system of irrigation recorded sufficiently taller plants (116.72 cm) compared to drip, sub-surface and alternate furrow systems, the latter three being at par.

2. Numbers of branches per plant was also found to be significantly higher in micro-sprinkler irrigation than in case of drip, sub-surface and alternate furrow systems. The last two systems as well as the drip and sub-surface were at par but the drip showed significantly higher number of branches compared to alternate furrow system.

3. Number of leaves per plants was found to be significantly higher in case of micro –sprinkler irrigation than in drip, sub –surface and alternate furrow systems, the last three being at par.

4. micro- sprinkler irrigation is better than drip, sub –surface and alternate furrow system, the last three being at par.

5. Micro-sprinkler irrigation registered significantly higher yield (13123.35 kg/ha) over drip (11836.42hg/ha), sub –surface (11825.89kg/ha) and alternate furrow (10630.58kg/ha) systems, were at par yet showing 23.45%,11.34%and 11.24%gain over alternate furrow irrigation.

6. Drip and sub-surface systems were at par yet showing significantly higher yield over alternate furrow system

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